REMARKS

This application has been carefully reviewed in light of the Office Action dated June 19, 2003. Claims 1, 25, 41, and 42 have been amended. Applicant respectfully requests reconsideration of the above-referenced application in light of the amendments and following remarks.

Applicant acknowledges that the species disclosed in Figures 1-12, pertaining to claims 90-105 and 112-116 have been elected for continued prosecution without traverse. Accordingly, the species disclosed in Figures 13 and 14, pertaining to claims 106-111 are withdrawn from consideration as directed to a non-elected invention.

As requested by the Examiner, a copy of form PTO-1449 filed on January 25, 2003 is being concurrently submitted herewith.

Claims 90, 92, 96-103, 112, 115 and 116 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Anderson. Reconsideration is respectfully requested.

Anderson does not teach a method of forming a photosensor comprising "providing a semiconductor substrate having a doped layer of a first conductivity type, forming a plurality of trenches in said doped layer to define a photosensitive area . . . doping the sidewalls and bottom of each of said plurality of trenches to form a doped region of a second conductivity type and forming an insulating layer on the sides and bottom of each of said plurality of trenches over said doped region," as recited in claim 90 (emphasis added), or a method of forming a photosensor comprising "providing a semiconductor substrate having a doped region of a first conductivity type, forming a plurality of trenches in said doped region to define a photosensitive area, each of said plurality of trenches having a plurality of sidewalls and a bottom doped to a second conductivity type and forming an insulating layer on the sides and bottom of each of said plurality of trenches," as recited in claim 112 (emphasis added).

Anderson merely teaches "a method to eliminate undesirable gated diode leakage near the top of the trench for trench capacitor type devices such as high density dynamic random access memories." (Col. 1, lines 43-46) (emphasis added). Anderson does not teach a method for forming a photosensor having a photosensitive area.

The Office Action asserts that Anderson teaches "forming plurality of trenches 16a, 16b . . . each of said plurality of trenches having a plurality of sidewalls and a bottom [and] doping the sides and bottom of each of the plurality of trenches to form a doped region 50." (Office Action, pg. 4). Applicant respectfully disagrees.

Anderson does not teach a plurality of trenches or doping the sides and bottom of the trenches to form a doped region. Anderson is directed to forming a capacitor and teaches "trench capacitors 16a and 16b . . . [and] on the outside of the trench capacitor walls, is an implanted layer 50 of arsenic." (Col. 3, lines 10-15) (emphasis added). Thus, the inside of "the trench capacitor walls contain a gate dielectric 52." (Col. 3, lines 19-20) (emphasis added).

Independent claims 90 and 112 recite a plurality of trenches which define a photosensitive area. Anderson does not teach or suggest this. Further, Anderson does not teach that an insulating layer is formed over the doped regions of the trench sidewalls and bottom, as further recited in claim 90.

Claims 92 and 96-103 depend from claim 90 and are allowable along with claim 90 for at least the reasons set forth above. Similarly, claims 115 and 116 depend from claim 112 and are allowable along with claim 112 for at least the reasons set forth above.

Dependent claim 103 further recites "four orthogonal angled implants implanted at a dose of 1×10^{12} to 1×10^{16} ions/cm^2 . . . wherein the angle of implantation for each angled implant is greater than θ_C, where $\tan \theta_C = [(t + d)/(\frac{1}{2} w)]$." (emphasis added). Anderson teaches a low angle implant and a high angle implant i.e., two implants and not four orthogonal implants as claimed by the Applicant. Accordingly, Applicant

respectfully submits that the cited reference fails also to teach this claim limitation.

Withdrawal of the 35 U.S.C. § 102(a) rejection of claims 90, 92, 96-103, 112, 115 and 116 is respectfully solicited.

Claims 94 and 95 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Anderson in view of Wolf. Reconsideration is respectfully requested.

Wolf does not provide any teachings or suggestions which are relevant to claim 90 from which claims 94 and 95 depend. For at least the reasons discussed above regarding claim 90, claims 94 and 95 are similarly allowable. In particular, Anderson does not teach or suggest a method of forming a photosensor having a plurality of trenches formed to define a photosensitive area, wherein the insides of the trenches are doped, and an insulating layer is formed over the doped regions of the trenches.

Accordingly, claims 94 and 95 are not rendered obvious by the combination of Anderson in view of Wolf. Withdrawal of the obviousness rejection is respectfully requested.

Claims 90-105 and 112-116 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over Applicant's prior issued U.S. Patent No. 6,232,626 (" '626 patent"). Reconsideration is respectfully requested.

Applicant's present application claims a novel multi-trench photosensor that provides the photosensitive element with increased surface area as a result of the plurality of trenches. The multi-trench photosensor permits a pixel cell to have a higher charge capacity, improved dynamic range, and a better signal-to-noise ratio (Applicant's Specification, page 14, lines 1-4).

Applicant has amended independent claims 90 and 112 to recite "forming a plurality of trenches in said doped region to define a photosensitive area," for a photosensor as in claims 90 and 112. In contrast, FIG. 2 of the '626 patent merely

illustrates an array of photosensitive elements. The claims of the '626 patent do not teach or suggest the subject matter of the claims of the present application.

In summary, for all of the reasons set forth above, the cited references, whether considered alone or in combination, fail to disclose or suggest the above-mentioned important features of the claimed invention. Accordingly, the rejection of claims 90-105 and 112-116 should be withdrawn. Allowance of the application with claims 90-105 and 112-116 is solicited.

Dated: September 8, 2003

Respectfully submitted,

By

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